



REMARKS

The application has been amended in order to identify related applications. A copy of the related applications accompany this Amendment.

Respectfully submitted,

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2. A plasma reactor for processing a workpiece, said plasma reactor comprising:

an enclosure;

a workpiece support within the enclosure facing an overlying portion of the enclosure, said workpiece support and the overlying portion of said enclosure defining a process region therebetween extending generally across the diameter of said wafer support;

said enclosure having at least first and second openings therethrough near generally opposite sides of said workpiece support;

at least one hollow conduit outside of said process region and connected to said first and second openings, providing a first torroidal path extending through said conduit and across said process region;

a first coil antenna adapted to accept RF power, and inductively coupled to the interior of said hollow conduit and capable of maintaining a plasma in said torroidal path; and

[The plasma reactor of Claim 1] wherein said hollow conduit comprises a plenum extending around the axis of symmetry of said chamber and wherein said first and second openings are comprised within a continuous opening in said enclosure extending around the axis of symmetry of said chamber.

4. A plasma reactor for processing a workpiece, said plasma reactor comprising:

an enclosure;

a workpiece support within the enclosure facing an overlying portion of the enclosure, said workpiece support and the overlying portion of said enclosure defining a process region therebetween extending generally across the diameter of said wafer support;

said enclosure having at least first and second openings therethrough near generally opposite sides of said workpiece support;

at least one hollow conduit outside of said process region and connected to said first and second openings, providing a first torroidal path extending through said conduit and across said process region;

a first coil antenna adapted to accept RF power, and inductively coupled to the interior of said hollow conduit and capable of maintaining a plasma in said torroidal path; and

[The plasma reactor of Claim 1] wherein said conduit is formed of a metal material, said conduit having an insulating gap within a wall of the conduit extending transversely to said torroidal path and separating said conduit into two portions so as to prevent formation of a closed electrical path along the length of said conduit.

5. The plasma reactor of [Claim 1] Claim 2 wherein said coil antenna is wound around an axis generally parallel with the axis of said closed torroidal path.

7. A plasma reactor for processing a workpiece, said plasma reactor comprising:

an enclosure;

a workpiece support within the enclosure facing an overlying portion of the enclosure, said workpiece support and the overlying portion of said enclosure defining a process region therebetween extending generally across the diameter of said wafer support;

said enclosure having at least first and second openings therethrough near generally opposite sides of said workpiece support;

at least one hollow conduit outside of said process region and connected to said first and second openings, providing a first torroidal path extending through said conduit and across said process region;

a first coil antenna adapted to accept RF power, and inductively coupled to the interior of said hollow conduit and capable of maintaining a plasma in said torroidal path;

wherein said coil antenna is wound around an axis generally parallel with the axis of said closed torroidal path;

wherein said coil antenna comprises a first winding extending on one side of and along said conduit; and

[The plasma reactor of Claim 6] wherein said coil antenna comprises a second winding extending on an opposite side of and along said conduit.

8. The plasma reactor of [Claim 5] Claim 7 wherein said coil antenna comprises a winding disposed between said conduit and said chamber.

10. The plasma reactor of [Claim 6] Claim 7 further comprising at least one magnetic core extending between said chamber and said conduit in a direction generally parallel to the axis of said closed torroidal path, said first winding extending around said magnetic core.

13. The plasma reactor of [Claim 1] Claim 2 further comprising a closed magnetic core surrounding said conduit so as to have one portion of the magnetic core extending through a region between said chamber and said conduit, said coil antenna being wound around said close magnetic core.

15. A plasma reactor for processing a workpiece, said plasma reactor comprising:

an enclosure;

a workpiece support within the enclosure facing an overlying portion of the enclosure, said workpiece support and the overlying portion of said enclosure defining a process region therebetween extending generally across the diameter of said wafer support;

said enclosure having at least first and second openings therethrough near generally opposite sides of said workpiece support;

at least one hollow conduit outside of said process region and connected to said first and second openings, providing a first torroidal path extending through said conduit and across said process region;

a first coil antenna adapted to accept RF power, and inductively coupled to the interior of said hollow conduit and capable of maintaining a plasma in said torroidal path;

[The plasma reactor of Claim 1 further comprising:]

an array of pairs of openings through said vacuum enclosure, each pair of openings near generally opposite sides of said workpiece support; and

an array of generally mutually parallel hollow conduits outside of said vacuum chamber that includes said one hollow conduit, and connected to respective ones of said pairs of openings, whereby to provide respective closed torroidal paths for plasma, each of said respective closed torroidal paths extending outside of said vacuum chamber through a respective one of said array of conduits and extending inside said vacuum chamber between a respective pair of said openings across said wafer surface.

20. The reactor of [Claim 1] Claim 2 wherein said conduit has a width along an axis parallel with the plane of said wafer support which is at least as great as the diameter of said wafer support.

23. A plasma reactor for processing a workpiece, said plasma reactor comprising:

an enclosure;

a workpiece support within the enclosure facing an overlying portion of the enclosure, said workpiece support and the overlying portion of said enclosure defining a process region therebetween extending generally across the diameter of said wafer support;

said enclosure having at least first and second openings therethrough near generally opposite sides of said workpiece support;

at least one hollow conduit outside of said process region and connected to said first and second openings, providing a first torroidal path extending through said conduit and across said process region;

a first coil antenna adapted to accept RF power, and inductively coupled to the interior of said hollow conduit and capable of maintaining a plasma in said torroidal path; and

[The reactor of Claim 1] wherein the height of said closed torroidal path along an axis generally perpendicular to a plane of said wafer support in a process region overlying said workpiece support is less than elsewhere in said closed torroidal path, whereby to enhance the plasma ion density in said process region relative to the plasma ion density elsewhere in said closed torroidal path.

24. The plasma reactor of [Claim 1] Claim 23 wherein the height of said closed torroidal path along an axis is generally perpendicular to a plane of said wafer support in a process region overlying said workpiece support is less than elsewhere in said closed torroidal path, whereby to enhance the plasma ion density in said process region relative to the plasma ion density elsewhere in said closed torroidal path.

27. The plasma reactor of [Claim 1] Claim 23 further comprising an RF bias power supply coupled to said wafer support capable of maintaining a plasma sheath over a workpiece on said workpiece support of a thickness which constricts said closed torroidal path so as to enhance plasma ion density in a process region overlying said workpiece support.

28. The plasma reactor of [Claim 1] Claim 23 further comprising an RF bias power supply coupled to said wafer support.

34. The plasma reactor of [Claim 1] Claim 23 wherein said vacuum enclosure comprises a longitude side wall and an overlying lateral

ceiling, and wherein said first and second openings extend through said ceiling.

35. A plasma reactor for processing a workpiece, said plasma reactor comprising:

an enclosure;

a workpiece support within the enclosure facing an overlying portion of the enclosure, said workpiece support and the overlying portion of said enclosure defining a process region therebetween extending generally across the diameter of said wafer support;

said enclosure having at least first and second openings therethrough near generally opposite sides of said workpiece support;

at least one hollow conduit outside of said process region and connected to said first and second openings, providing a first torroidal path extending through said conduit and across said process region;

a first coil antenna adapted to accept RF power, and inductively coupled to the interior of said hollow conduit, and capable of maintaining a plasma in said torroidal path; and

[The plasma reactor of Claim 1] wherein said vacuum enclosure comprises a longitudinal side wall and an overlying lateral ceiling, and wherein said first and second openings extend through said side wall.

36. The reactor of [Claim 1] Claim 23 wherein said conduit is elongate and tubular of a cross-sectional shape that is one of curved or rectangular, said first and second openings mating with respective ends of said conduit.

REMARKS

In response to the Office Action dated February 7, 2002, Claims 2-24, 27, 28, 30-37 are now in this application. Claims 1, 25 and 26 have been canceled. Claims 2, 4, 5, 7, 8, 10, 13, 15, 20, 23, 24, 27, 28, 34, 35, and 36 have been amended.

Claim 1, 5, 6, 10, 13, 14, 20-22, 27, 28, 34 and 36 were rejected under 35 USC 102(b).

Claims 1, 5, 6, 10, 13, 14, 20, 21, 22, 27, 28, 34 and 36 were rejected under 35 USC 102(e).

Claims 1, 4, 5, 6, 8-10, 12-14, 20-22, 24, 27, 28, 34 and 36 were rejected under 35 USC 103(a).

Claims 1, 4, 5, 6, 8, 9, 10, 12, 13, 14, 20, 21, 22, 24, 27, 28, 34 and 36 were provisionally rejected under obviousness-type double patenting.

Claims 2, 3, 7, 11, 15-19, 23, 25, 26, 30-33, 35 and 37 were objected to as being dependent upon a rejected base claim.

No new matter has been added. Reexamination and reconsideration of the amended application is requested.

Claim Rejections - 35 USC § 102

Claims 1, 5, 6, 10, 13, 14, 20-22, 27, 28, 34 and 36 are rejected under 35 USC 102(b) as being anticipated by Reinberg et al. (U.S. Patent No. 4,431,898). Claims 1, 5, 6, 10, 13, 14, 20, 21, 22, 27, 28, 34 and 36 are rejected under 35 USC 102(e) as being anticipated by U.S. Application Serial No. 09/584,167.

The rejections under 37 CFR 102(b) and (e) have been overcome because all of the claims that were held to be allowable if rewritten in independent form have been amended.

Claim Rejections - 35 USC § 103

Claims 1, 4, 5, 6, 10, 13, 14, 20, 21, 22, 24, 27, 28, 34 and 36 are rejected under 35 USC 103(a) as being unpatentable over Reinberg et al. (U.S. Patent No. 4,431,898) in view of Smith et al. (U.S. Patent No. 6,150,628). Claims 1, 5, 6, 8-10, 12-14, 20-22, 27, 28, 34 and 36 are rejected under 35 USC 103(a) as being unpatentable over

Reinberg et al. in view of Anderson (U.S. Patent No. 3,291,715). Claims 1, 4, 5, 6, 8, 9, 10, 12, 13, 14, 20, 21, 22, 24, 27, 28, 34 and 36 are provisionally rejected under 35 USC 103(a) as being obvious over co-pending Application Serial No. 09/584,167 which has a common Assignee with the instant application in view of Smith et al. and Anderson.

Applicants traverse the rejection of Claim 4 as the rejection of Claim 4 is based upon an erroneous assertion that Smith et al. teaches an insulating gap dividing a conductive tube into two portions. Smith et al. doe not disclose such a feature. Quite the contrary: Smith et al.'s insulators 108,110 block the hollow channel within the tube, NOT the walls of the tube. This prevents, in Smith et al., "induced current flow from forming within the CHAMBER" (Col. 9, line 16), not within the walls of the tube itself. Therefore, Smith et al. cannot meet the language of Claim 4, "said CONDUIT having an insulating gap within a wall of the conduit." Therefore, reconsideration and withdrawal of the rejection of Claim 4 under 35 USC 103(a) is respectfully requested.

Double Patenting

Claims 1, 4, 5, 6, 8, 9, 10, 12, 13, 14, 20, 21, 22, 24, 27, 28, 34 and 36 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims of co-pending U.S. Application Serial No. 09/584,167 in view of Smith et al. (U.S. Patent No. 4,431,898) and Anderson (U.S. Patent No. 3,291,715). Applicants submit herewith a Terminal Disclaimer to Obviate a Double Patenting Rejection Over a Prior Patent to overcome the double-patenting rejection.

Allowable Subject Matter

Claims 2, 3, 7, 11, 15-19, 23, 25, 26, 30-33, 35 and 37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

Claims 2, 7, 15, 23, and 35 have been amended so that they do not depend from a rejected base claim. Claims 25 and 26 have been canceled. As Claims 2, 7, 15, 23, and 35 have been amended, the rejected Claims 3, 11, 16-19, 30-33 and 37 are now allowable. Therefore, it is respectfully requested that the rejection of Claims 2, 3, 7, 11, 15-19, 23, 25, 26, 30-33, 35 and 37 be withdrawn.

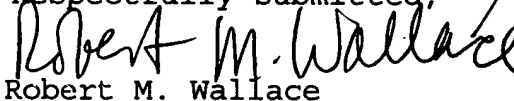
Summary

In view of the foregoing corrections and remarks, it is felt that the rejections of the claims under 35 USC 102(b), 102(e), 103(a) and the double-patenting have been overcome. Therefore, withdrawal of these rejections is respectfully requested and allowance of the application is earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any of the claims now pending in the application, the Examiner should telephone Mr. Robert M. Wallace at (805) 644-4035 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Date: May 7, 2002

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